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AUTHOR Broski, David C.
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ABSTRACT

The comprehension of rate-altered recordings by 30 learning disabled children (7- to 10-years-old) was investigated in an attempt to determine whether providing instruction by way of an advantaged modality would result in more effective learning. Ss were divided into two groups, auditory and visual, on the basis of identified communication channel strengths measured by the Illinois Test of Psycholinguistic Abilities, and those groups were further divided into grade levels (1, 2, and 3) with five Ss at each level. Listening passages were presented at normal (125 words per minute), expanded, and compressed rates, and comprehension was measured through orally administered cloze tests. Although Ss with identified auditory strengths had greater observed mean scores in listening comprehension of rate-altered instruction than Ss with visual strengths, differences were not statistically significant. Other findings tended to support the contention that children in higher academic grades are more able to comprehend rate-altered instruction than those in lower academic grades, and that comprehension is not affected by changes of word rate from 95 to 175 words per minute. (LS)

AUDITORY LEARNERS AND COMPREHENSION OF RATE-ALTERED RECORDINGS

by

David C. Broski

Michigan State University

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Consortium on Auditory Learning Materials for the Handicapped

Michigan State University

ABSTRACT

The major purpose of this study was to investigate the applicability of **advantaged auditory instruction** with learning disabled primary school children. **Advantaged instruction** focuses on the child's skill areas that are functioning at the highest levels and uses these skill areas for instructing. Rather than working on deficit areas, the instruction is provided through the child's strong areas. In this manner, necessary information that can assist the child in functioning is provided. At the same time, remedial instruction can be provided for the deficit areas. However, the procedure recognizes the child's strengths and does not put them aside for remediation. Advantaged auditory instruction, in essence, implies that teaching to the learner's strengths and bypassing his deficits results in effective learning.

To investigate this concept, a sample of thirty learning disabled primary school children with reading problems were divided into two groups, auditory and visual, on the basis of identified communication channel strengths measured by the Illinois Test of Psycholinguistic Abilities. The hypothesis of major interest was that those subjects identified as auditory learners would be more able to comprehend rate-altered instruction than those identified as visual learners. Although this hypothesis was not statistically supported, implications for the potential use of advantaged auditory instruction as an educational tool are provided.

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David C. Broski

INTRODUCTION

Oral Communication

Americans live, today, in a verbal society. A large proportion of their communication time is spent in the reciprocal auditory-vocal interchange. To illustrate, it has been suggested that, "A person might write a book a year; read a book a month; and speak a book a week; but hears and listens a book a day" (Lundsteen, 1966).

This phenomenon extends into the American schools and plays an important role in the delivery of instruction. Stanford Taylor, for example, reports that over 50% of a child's time in the elementary classroom is spent in the act of listening (Taylor, 1973). Further support for Taylor's contention comes from Lundsteen when she states that, "Listening accounts for over one-half the time in school activities. It is the most continuously needed Language Arts skill; and yet, traditionally, it has been the most neglected" (Lundsteen, 1966).

In the primary and intermediate grades, according to Taylor, listening skills are more advanced than reading skills for children of average intelligence and scholastic ability. He feels that children in these grades prefer to listen rather than read, if offered a choice. Listening is a more common act, one that children have had many years of practice in performing.

As children encounter reading problems, the reliance upon listening becomes even more marked. For example, Taylor concludes:

> In general, less competent students, those judged to be less intelligent and scholastically below average, show a marked preference for listening over reading in most learning situations and do retain more from listening. The slower student depends on the special attributes of listening for much of his understanding. In listening, he is assisted in interpreting content by the phrasing and expression of the speaker, while in reading he must construct his own linguistic units in order to realize meaning (Taylor, 1973).

Durrell adds further support by claiming, "In all primary grades, listening vocabulary is much superior to reading vocabulary. Listening is a broader channel for acquiring information than is reading at this level, since reading skills are immature (Durrell, 1969).

Although the auditory channel of communication is heavily relied upon as the primary information receptor for many children, research and material development in the area lags far behind efforts in reading. Keller, for example, terms listening research, "embryonic" in comparison to research in reading and speaking (Keller, 1966). Anderson, in calling for needed research in listening reports the following:

> Unfortunately, however, progress in the teaching of listening is hampered by the paucity of research in the field. In comparison with reading, virtually no research has been done in listening (Anderson, 1952).

He concludes:

> The more than 3,000 studies which have been made in the field of reading have given us considerable understanding of the physiology, psychology, and sociology of reading. We have no such body of knowledge about listening (Anderson, 1952).

Similarly, reading material development outdistances auditory material development. For example, a survey of 382 members of the Council for Exceptional Children's Division on Children with Learning Disabilities was recently conducted to identify materials and techniques used with learning disabled children. By far the greatest number of identified materials and techniques were in the areas of "remedial reading" and "visual perception" (44%). Only 5% of the materials and techniques identified related to the auditory area and they were defined as "auditory perception" materials (Kass and Lewis, 1973). Although a proportion of those children identified as learning disabled suffer reading problems, it appears that few auditory materials are currently available for their instruction.

Advantaged Instruction

There is a current emphasis upon individualizing instruction with optimum efficiency for educators at all levels. Individualizing instruction, for purposes of this study, was defined in terms of **advantaged instruction.** The Consortium on Auditory Learning Materials for the Handicapped defines **advantaged instruction** as:

> Instruction that focuses on those areas that are functioning at the highest levels and that takes advantage of the child's functioning ability to promote further learning; this approach bypasses those functioning aspects of the child that are low in an

> attempt to provide necessary information that can promote normal performance in his environment (The Consortium on Auditory Learning Materials for the Handicapped, 1974).

Advantaged instruction, in essence, implies that teaching to the learner's strengths and bypassing his deficits results in effective learning. The key notion underlying such a concept is that instruction is designed to capitalize upon individual strengths of learners. Deficits are not remediated directly. If, for example, a figure-ground problem were diagnosed in a child, an instructional program would be designed to **bypass** this problem rather than to **remediate** it. The child's strengths would be assessed and the instructional programming would be designed to match those strengths. Advantaged instruction is, then, matching the medium of instruction to learner strengths—not to remediating deficits.

The advantaged instruction concept has been operationalized, to some degree, at Oakland Community College, Bloomfield Hills, Michigan. Students are administered a battery of tests upon admission. Instructional formats are based on strengths identified in the testing. The administrators of the institution, Joseph E. Hill and Derek N. Nunney, further this notion of advantaged instruction by claiming:

> An aim of the teacher is to diagnose the style of the student, determine his strengths, and begin to instruct him, utilizing media which will capitalize on his strengths. The task, then, is one of matching the cognitive style of the student to the style of the mode of presentation of information (Nunney and Hill).

One method of individualizing instruction in an advantaged manner may be the diagnosis of communication channel strengths prior to instructional programming. By diagnosing the generalized attribute of communication channel strength prior to instructional programming, more effective and efficient learning may result; if, in fact, those attributes are matched with the instructional medium.

Rate-Altered Instruction

Auditory instruction in the past suffered from a fixed rate of presentation set by the speaker and beyond the control of the listener. This is no longer the case. Rate-altered instruction, a relatively new technology, has the ability to change the rate of presentation with little effect upon vocal pitch and quality. When expanded (slowed) and matched with students needing more processing time (typing students,

language students, retardates) they can be more effective than normal rates (Foulke, 1973). When compressed and matched with auditory learners, they may produce equivalent achievement in less time than normal rates. Thus, by providing input by way of an advantaged modality, the time saved could be used for additional instruction or remediating deficits.

This technology has advanced to the point where students will soon be able to manage word rates for themselves. The Cambridge Research and Development Group recently announced the granting of a patent for a Variable Speech Control. The mechanism will electronically speed up or slow down recorded speech without distortion. Manufacturers will be able to adapt the device to standard audio cassette recorders with estimated costs of less than $50.00 per unit (Center for Rate Controlled Recordings Newsletter, 1974). A financially affordable innovation will be available for classroom use in the near future. If educators are to make profitable use of such available technologies, it seems important that those students most likely to benefit from such use be identified.

PURPOSE

This study sought to investigate the comprehension of rate-altered recordings by learning disabled primary school children with identified auditory or visual strengths. It attempted to find initial answers to the question, "Does providing instruction by way of an advantaged modality result in more effective learning?"

RESULTS

Four major hypotheses were drawn for the study. These were:

1. Type of Learner:

   Those children identified as auditory learners will be more able to comprehend rate-altered instruction than those identified as visual learners.

2. Academic Grade Level:

   Third grade comprehension scores will exceed second grade scores, which in turn will exceed first grade scores.

3. Word Rate Measure:

   Comprehension scores will be greater at the expanded rate (95 w.p.m.) than at the normal rate (125 w.p.m.), which in turn will exceed the compressed rate (175 w.p.m.).

4. Interaction With Word Rate:

   It is expected that an interaction between type of learner (auditory and visual) and word rate will be detected.

IMPLICATIONS

All hypotheses were tested at the .05 level of confidence set prior to the experiment according to traditional research conventions. No null hypothesis was rejected at this level. Therefore, the alternatives could not be accepted. However, a number of observations were made from the research and are presented below:

1. Learning disabled primary school children with identified auditory strengths generally appear to be more able to comprehend rate-altered instruction than those children with visual strengths. In this investigation, the obtained probability of the F-ratio for this Type of Learner main effect was .08. The area seems worthy of future research.

2. Past research has indicated that children in higher academic grade levels seem to be more able, generally, to comprehend rate-altered instruction than those children in lower academic grade levels. The obtained probability of the F-ratio in this investigation for the Academic Grade Level main effect was .088. This tends to support the contention that those children in higher academic grades are more able to comprehend rate-altered instruction than those in lower academic grades.

3. When the rates of auditory presentations are kept within reasonable and narrow limits (approximately 95-175 w.p.m.) their alteration tends to have little effect upon comprehension. In other words, comprehension is not affected by changes of word rate from 95 to 175 w.p.m. If comprehension at faster rates is equal to comprehension at slower rates, then it appears that the compressed rate is preferable when learning per unit of time is a consideration.

4. Reading comprehension and listening comprehension ability correlated weakly (0.27) in this investigation. In predicting the success of rate-altered instruction with learning disabled primary children, a diagnosis of communication channel strength may serve as a strong predictor variable. The area seems to be worthy of future research.

5. **The Illinois Test of Psycholinguistic Abilities** (ITPA) appears to be a viable tool for measuring communication channel strengths and weaknesses. It may be useful, therefore, in predicting success in advantaged instructional treatments matched to those strengths. This is especially so in terms of the auditory reception, auditory closure, visual reception, and visual closure subtests of the ITPA.

6. Auditory instruction in general, and rate-altered instruction in particular, are valuable educational tools for children with low reading skills. Although reading and listening seem to demand a somewhat similar set of skills, being a "poor" reader does not appear to preclude being a "good" listener.

7. It seems important that consideration of students' strengths and preferences be made before they are programmed into a lock-step instructional sequence. If such a philosophy is embraced, it is imperative that optional learning experiences be provided learners to ensure maximum success. If existing technologies and diagnostic techniques can successfully match students to programs, it seems far better to adapt such programs to students, rather than students to programs.

8. Learning disabled children in general, and those with reading problems in particular, are in great need of alternative methods of receiving instruction. It is not recommended that the development of reading skills be deemphasized, but, rather that advantaged instructional methodologies be researched and developed to provide instruction concurrent with remediational activities.

PROCEDURES

The Population

The population studied in this research is generally termed "learning disabled." That is to say, a discrepancy exists between expected and

actual academic achievement for these pupils not due to physical handicaps nor mental retardation.

Generally, the population fits this description by Bateman:

> ...children who have learning disorders are those who manifest an educationally significant discrepancy between their estimated intellectual potential and actual level of performance related to basic disorders in the learning process, which may or may not be accompanied by demonstrable central nervous system dysfunction, and which are not secondary to generalized mental retardation, educational or cultural deprivation, severe emotional disturbance, or sensory loss. Frequently these learning disorders seem to fit into one or more of three broad types—reading problems, visual-motor disturbance, and verbal communication disorders...(Bateman, 1965).

One of the three broad types identified by Bateman—children with reading problems—was of prime importance in this study.

The Sample

The sample was taken from the first, second, and third grades in a specialized learning center serving this population. Subjects ranged from seven through ten years of age.

An initial examination of health records for these primary students assured that those subjects who might comprise the sample possessed auditory and visual faculties within a normal range. This screening procedure left 78 primary pupils for application of the sampling instrument.

Subsequently, four subtests of the **Illinois Test of Psycholinguistic Abilities** (ITPA) were administered individually to determine sample subsets. These were: Auditory Reception, Auditory Closure, Visual Reception, and Visual Closure. Administrators of the subtests were trained by a qualified, experienced examiner before the testing phase was begun.

Subjects were directly assigned to either auditory or visual groups on the basis of test results. Either one of two criteria were applied in making this assignment. First, if a subject's mean score on the two auditory subtests was at least six standard (scaled) score points above his mean score on the two visual subtests, he was assigned to an auditory group. For example, Student X receives the following scaled scores on the four subtests: Auditory Reception—43; Auditory Closure—46; Visual Reception—38; and Visual Closure—36. These

scaled scores yield an auditory mean of 44.5 and a visual mean score of 37.0, with a difference of 7.5. Thus, according to Criterion one, this subject was assigned to an auditory group. Visual groups were built conversely. A similar criterion was used by Waugh, in 1973.

Secondly, differences between the mean scaled score of all four subtests and the scaled score of any particular subtest constituted a discrepancy if the magnitude of that difference was seven or more points. To illustrate, Student Y receives the following scores on the four subtests: Auditory Reception—27; Visual Reception—25; Auditory Closure—27; and Visual Closure—40. The mean of all scaled scores, in this case is 29.75. The difference between this mean of all scaled scores and the scaled score for the Visual Closure subtest is 10.25, indicating a visual strength. In this instance, Student Y is assigned to a visual group. Auditory groups were built in a conversely similar manner. This criterion is recommended for determining discrepancies in psycholinguistic functions by the test's authors (Kirk, 1968).

The ITPA subtests were administered to 78 students, one at a time, for approximately 30 minutes each. Those subjects not exhibiting discrepancies according to the aforementioned criteria were rejected from sample inclusion. Next, the remaining subjects were assigned to either an auditory or visual group, depending upon strengths measured. Each group was then broken into grade levels; grades one, two, and three, respectively. Finally, an equal number of subjects at each grade level was obtained by discarding those subjects with the lowest intraindividual discrepancies. To illustrate, if according to Criterion one the mean score difference between auditory and visual subtests were to be six scaled score points or more and to ensure equal cell size one subject needed to be discarded, the subject in that cell with the lowest mean difference score was dropped.

The sampling process identified fifteen auditory and fifteen visual subjects for a total sample size of thirty. The auditory and visual groups were further divided into grade levels (one, two, and three) with five subjects at each level.

Design

This research was of a quasi-experimental design (Campbell and Stanley, 1963). Multiple measures were administered. Each was followed by a post-test. The two experimental groups, auditory and visual, were not randomly assigned. Subjects were directly assigned from ITPA results as previously described. Since subjects were not randomly assigned to groups, their selection was considered as a threat

to internal validity. Therefore, an Analysis of Covariance was used to accommodate initial differences between groups. The covariate was to accommodate initial differences between groups. The covariate was reading comprehension, measured by the Gates-MacGinite Reading Tests Primary Forms A Through C. Reading comprehension was found to be a significant subject variable in the comprehension of compressed speech by Mullaly, in 1972. That is, those subjects with higher reading achievement level scores were significantly more able to comprehend compressed speech. It was controlled for in this research to better equate the groups.

A concern for external validity arose from what might be termed multiple-treatment interference. This may occur if the effects of an earlier treatment are still present when the subject encounters a subsequent treatment. Often called carry-over effects, they were controlled by systematically ordering the presentation of the recorded listening passages. In this manner, each subject was presented a listening passage at an expanded, a normal, and a compressed rate. Each passage was followed by an oral administration of a modified Cloze Comprehension Test.

Design Matrix

The design matrix took the form of a two-way, fully crossed design having a single repeated measure. Equal numbers of observations were made in all cells. The design variables were Type of Learner and Academic Grade Level. Academic Grade Level was used primarily as a blocking variable to increase precision. The repeated measure variable was Word Rate. The dependent variable was Listening Comprehension measured by a modified cloze test following each exposure to the rate-altered listening passages. The design matrix appears in Figure 1.

FIGURE 1

Design Matrix Over Variables

WORD RATE

TYPE OF LEARNER	Grade Level	Expanded 30%	Normal	Compressed 30%
Auditory	1st	S_1 . . . S_i		
	2nd	S_{i+1} . . . S_{2i}		
	3rd	S_{2i+1} . . . S_{3i}		
Visual	1st	S_{3i+1} . . . S_{4i}		
	2nd	S_{4i+1} . . . S_{5i}		
	3rd	S_{5i+1} . . . S_{6i}		

Two analysis techniques were used to examine the data. An Analysis of Covariance was employed to investigate the effects of the design variables—Type of Learner and Academic Grade Level. Reading comprehension served as the covariate to accommodate initial differences between groups. To examine the effects of the repeated measure variable, Word Rate, an Analysis of Variance was employed. This analysis technique is suggested by Winer for examining the effects of a single repeated measure (Winter, 1962).

Stimulus Material

Three listening passages of approximately 100 words each were selected for use in the study. Passage One was taken, by permission, from the Reading Progress Scale by Ronald P. Carver (Carver, 1971). Passages Two and Three were excerpted from a story in a basal reader. An experienced announcer recorded the passages and a set of introductory statements for presentation to the subjects. All recording and duplicating was done with professional quality equipment in the Great Lakes Region Special Education Instructional Materials Center at Michigan State University.

A rate of approximately 125 words per minute was chosen as the normal rate for the passages. All expansion and compression was done from this base rate. The nature of the population influenced the selection of this base rate; that is, learning disabled primary school children. Additionally, Carver and others used a similar normal rate in recent compressed speech research (Carver, 1971-72).

Each original recording was expanded and compressed approximately 30% with a Lexicon Varispeech I and duplicated in cassette form. This process yielded nine cassette tapes: three different passages at the normal rate; an expanded version of each passage; and a compressed version of each passage.

Comprehension Measures

Prior to its use, each listening passage was scaled for readability by the Fry Readability technique (Fry, 1968). Each passage selected was found to be appropriate for a primary audience—approximately at the third grade level. This procedure was used to provide continuity in the level of difficulty across all three passages. Although developed originally as a measure designed to evaluate reading, readability formulas can be applied to listening passages as well. Sticht reports:

With regard to the difficulty level of the material, the reading and listening performance of both groups declined as the difficulty of the material was increased. Thus, the readability formula appears to have been appropriate for scaling "listenability" also (Sticht, 1971).

Subsequently, a modified cloze test, termed reading-input, was developed for each passage. These reading-input measures were developed through a standardized algorithmic procedure created by Carver (Carver, 1973). The purpose of the resulting comprehension instrument was to measure the ability of a subject to recall deleted portions of a listening passage. Three reading-input measures, each consisting of twenty items, were produced. These were hand scored using a standard correction for guessing—rights minus wrongs.

The passages were administered on a one-to-one basis in a listening carrel. Each subject received a taped introductory statement followed by the listening experience. Appropriate comprehension measures were orally administered following each presentation.

Analysis

Subjects' scores were hand-coded and keypunched into cards. These scores and that of the covariate of reading comprehension were analyzed via the Michigan State University CDC 6500. An Analysis of Covariance (ANCOVA) program supported by the STAT system directed the actual analysis for the design variables. An Analysis of Variance (ANOVA) program directed the actual analysis for the repeated measure variable. The hypotheses were tested at the .05 level for significance. Use of the Michigan State University computing facilities was made possible through support, in part, from the National Science Foundation.

DISCUSSION

Two potential areas of investigator error must be described for others who might research the concept of advantaged auditory instruction. First, the sample size was rather small (N = 30). With an increase in subjects, statistically significant differences might have been detected. Second, a modification of the standard cloze technique was used to measure listening comprehension. Its developer, Ronald P. Carver, indicates that this modification as well as the standard cloze, is less sensitive to differences in understanding than other measures (Carver, 1971). An alternative listening comprehension measure may have detected differences. The options, however, are limited.

An Analysis of Variance and an Analysis of Covariance were used to detect differences in the data. Results were presented in Tables One and Two.

TABLE ONE

Analysis of Covariance (ANCOVA) Results For Listening Comprehension Scores

Source of Variation	d.f.	Mean Squares	F-Ratio	p
Between Types of Learners	1	57.7391	3.2733	0.083
Between Academic Grade Levels	2	47.7790	2.7078	0.0879
Interaction Between Type of Learner and Academic Grade Level	2	3.8625	0.2190	0.8051
Error Term	23	17.6392		

N = 30

TABLE TWO

Analysis of Variance (ANOVA) Results For Listening Comprehension Scores

Source of Variation	d.f.	Mean Squares	F-Ratio
Between Word Rate Measures	2	16.0444	0.9101
Interaction Between Type of Learner and Word Rate Measure	2	13.3778	0.7588
Interaction Between Academic Grade Level and Word Rate Measure	4	17.7111	1.0044
Interaction Between Type of Learner, Word Rate Measure, and Academic Grade Level	4	10.6444	0.6037
Error Term	48	17.6333	

N = 30

The result of the Analysis of Covariance between Type of Learner groups (Auditory and Visual) was not significant at the .05 level of confidence. The probability of the obtained F-ration was .08. An inspection of the data in Table Three below, reveals differences in the comprehension test mean scores according to learner type which are generally consistent with the hypothesized superiority of auditory groups to more readily comprehend rate-altered instruction. Thus, while significant differences were not found through an Analysis of Covariance, the data does suggest a difference not discernable in the F-test and which is not likely due to chance.

TABLE THREE

Means and Standard Deviations of Listening and Reading Comprehension Measures by Type of Learner and Academic Grade Level

	AUDITORY GROUP				VISUAL GROUP			
Grade Level	List. Mean	List. S.D.	Rdg. Mean	Rdg. S.D.	List. Mean	List. S.D.	Rdg. Mean	Rdg. S.D.
1	6.93	3.69	40.20	4.09	3.20	5.19	40.20	10.23
2	9.86	2.56	50.08	13.44	9.33	5.36	57.20	11.39
3	11.07	4.68	39.60	6.62	8.27	3.42	44.60	7.77

N = 30

Subjects with identified auditory strengths had greater observed mean scores in listening comprehension of rate-altered instruction than those subjects with identified visual strengths. At the same time, however, the reading comprehension scores measured by the Gates-MacGinite reading tests for the auditory group were lower, on the average, than those for the visual group. Thus, while the reading comprehension abilities of the auditory group were lower than or equal to those of the visual group, their listening comprehension abilities were greater in each case. The generally ascending mean scores according to grade level further indicate a superiority for academically advanced students to more readily comprehend rate-altered instruction, as might be expected.

A Pearson product-moment coefficient of correlation between listening comprehension and reading comprehension was computed from the data. This revealed a rather low index of 0.271 for the sample. Although listening skills and reading skills are no doubt strongly related, it appears that being a "poor" reader does not preclude being a "good" listener.

Altering the rate of presentation within a small range, approximately 95 to 175 words per minute, appeared to have little effect upon comprehension. In Table Four, mean scores of learner groups at each of the rates are presented.

TABLE FOUR

Mean Scores and Standard Deviations
At Expanded, Normal, and Compressed Rates
For Auditory and Visual Groups by Academic Grade Level

	AUDITORY						VISUAL					
Grade Level	Exp.	S.D.	Norm.	S.D.	Comp.	S.D.	Exp.	S.D.	Norm.	S.D.	Comp.	S.D.
1	5.6	4.3	6.0	5.1	9.2	2.99	2.0	6.2	3.2	6.0	4.4	3.5
2	12.0	3.8	8.0	3.3	9.6	3.4	9.2	6.0	10.4	5.3	8.4	5.6
3	8.4	5.7	11.2	6.0	13.6	4.1	8.0	4.2	8.4	6.1	8.4	3.9

Auditory groups, however, did exhibit consistently larger observed mean scores at the expanded and compressed rates than did their visual counterparts. Furthermore, observed mean scores for auditory learners were higher at the compressed rate than at any other in all instances but one.

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